[Total No. of Questions - 9] [Total No. of Printed Pages - 3] (2125)

15024

B. Tech 1st Semester Examination

Applied Physics-I (OS)

AS-1002

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question each from Section A, B, C & D. Section E (question 9) is compulsory.

SECTION - A

1. (a) Explain the formation of Interference fringes by a Fresnel's biprism. Explain the method to measure the wavelength of monochromatic light using the biprism. (15)

   (b) In a Newton's ring experiment, the diameter of 5th and 25th rings are 0.3cm and 0.8cm respectively. Find the wavelength of light, R=100cm. (5)

2. (a) Describe principle, construction and working of Nicol prism. (10)

   (b) Derive Einstein's mass energy relationship. Give its physical significance. (10)

SECTION - B

3. (a) Explain the concept of displacement current and derive Maxwell's equation $\nabla \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$ (8)

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   (b) Define poynting vector and derive an expression of poynting theorem for the conservation of energy in an electromagnetic wave and discuss the physical meaning of each term in the resulting equation. (12)

4. (a) What do you understand by dielectric materials and dielectric polarisation? Define electric vectors $\vec{D}, \vec{P}$ and $\vec{E}$ and establish a relationship between them. (10)

   (b) Derive an expression for energy stored in an electrostatic field. (10)

SECTION - C

5. (a) Solve the Schrodinger equation for a particle enclosed in one dimensional box of side l and obtain its eigen values. Show graphically its first three eigen functions. (12)

   (b) Derive time dependent Schrodinger wave equation. (8)

6. (a) Discuss Heisenberg's uncertainty principle. Use the principle to prove non-existence of electrons and existence of protons and neutrons in the nucleus. (10)

   (b) Derive the formula $\lambda = \frac{h}{m\nu}$ of the De-Broglie wavelength of a particle and calculate the De-Broglie wavelength of neutron of energy 28.8 eV. Given $m_n = 1.674 \times 10^{-27}$kg, $h = 6.62 \times 10^{-34}$JS. (10)

SECTION - D

7. (a) Discuss the principle and working of Bubble chamber. How is it different from cloud chamber? (10)

   (b) Discuss the principle and working of G.M. counter. (10)

8. (a) Explain the principle, construction and working of a solid state Detector. (10)

(b) Write the fission reaction of $_{92}U^{238}$ with thermal neutrons. Calculate the energy release in single fission. (7)

(c) Draw the block diagram of a nuclear fission reactor. (3)

SECTION - E

9. (a) What are Polar and Non-polar molecules? Give examples.

(b) What is a moderator? Give examples.

(c) Differentiate between inertial frame of reference and non-inertial frame of reference.

(d) What is Lorentz Filzgerald contraction?

(e) Why Newton's rings are circular?

(f) Write note on Planck's constant.

(g) Give physical interpretation of wave-function.

(h) Write two shortcomings of old quantum theory.

(i) What do you understand by a plasma?

(j) What do you understand by phase difference and path difference? (2×10=20)